U.S. Forest Service

RESEARCH NOTE

CENTRAL STATES FOREST EXPERIMENT STATION
COLUMBUS, OHIO — R. D. LANE, DIRECTOR

INTERMOUNTAIN STATION
Central Reference File
No. 0.73

CS-14 October 1963

INTERPLANT ALDER TO INCREASE GROWTH IN STRIP-MINE PLANTATIONS

Results from a 5-year-old planting indicate that European alder (Alnus glutinosa (L.) Gaertn.) is beneficial as a nurse crop to other tree species on a strip-mined area in eastern Kentucky.[1] Average height of five coniferous and five hardwood species ranged from about 4 to 50 percent greater when planted in alternate rows with European alder. The beneficial effects of European alder as a nurse crop have long been recognized in Europe where it is widely used for reclamation planting.[2] Not only does alder quickly provide shade, which retards evaporation of moisture from the soil, but it is also a nitrogen fixer.

In 1958 we interplanted 10 tree species with European alder on a strip-mine bank in Kentucky to find out how the alder would affect their survival and height growth (table 1). Mining had ceased 4 years before planting, but the spoil was still nearly bare of vegetation. The ungraded banks were loose, contained little massive hard rock, and were mainly silty clay shales. The spoil material was generally acid (pH 3.5 to 5.5) and, except for one plot containing some toxic material, the banks were considered favorable for tree growth.

1/ These plantings were established with the cooperation and assistance of the Kentucky Reclamation Association, Inc., and the Kentucky Department of Conservation.

2/ Kohnke, Helmut. The black alder as a pioneer tree on sand dunes and eroded land. Jour. Forestry 39: 333-334. 1941.

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Table 1.--Survival and average height of trees planted with and without alder

Species	Survival		Average height		
	With	Without	With	Without	Increase
	Percent	Percent	Feet	Feet	Percent
Sycamore (Platanus occidentalis L.)	30	53	12.4	8.1	53
Sweetgum (Liquidambar styraciflua L.)	47	67	8.7	6.7	30
White ash (Fraxinus americana L.)	85	93	7.4	5.9	25
Virginia pine (Pinus virginiana Mill.	93	93	8.1	6.7	21
Shortleaf pine (P. echinata Mill.)	73	75	9.2	7.9	16
Loblolly pine (P. taeda L.)	48	43	10.2	8.8	16
Cottonwood (Populus deltoides Bartr.)	60	40	10.1	9.0	12
Pitch pine (P. rigida Mill.)	87	92	6.7	6.0	12
Yellow-poplar (Liriodendron tulipifera L.)	50	68	4.8	4.3	12
White pine (P. strobus L.)	82	80	2.8	2.7	4

In March 1958 six plots were planted with one row each of the 10 test species. (All 10 species planted are recommended for this particular strip-mine planting zone in eastern Kentucky.[3]) European alder was interplanted on half the plots in alternate rows; no alder or leguminous shrubs were planted or allowed to grow within 100 feet of the other three plots. All trees were planted on a 6- by 6-foot spacing, 20 trees to a row.

[3] Limstrom, G. A. Forestation of strip-mined land in the Central States. U.S. Dept. Agr. Handb. 166, 74 pp., illus. 1960.

FIGURE 1.--Five-year-old Virginia pine between rows of European alder the same age.

Planting stock was in good condition when planted except for cottonwood, white ash, and loblolly pine. The bundles of these species were dry when received. In addition, many of the cottonwood roots were rotted, so this stock was heavily culled before planting.

European alder provided an early cover crop on the spoil, for it survived well (80 percent of the trees were alive after 5 years) and outgrew all other species (averaging 12.2 feet) (fig. 1).

Interplanting of alder has so far shown no significant effect upon survival of the 10 other species (table 1). Of these species, Virginia pine, pitch pine, and white ash survived the best with 90 percent or more still living. Sycamore, loblolly pine, and cottonwood had only 50 percent or less survival, but the ones that lived are now the tallest of the 10 species. Most of the mortality occurred the year of planting.

The "nursing" effect of alder did seem to stimulate height growth of the 10 species, some more than others. Sycamore, sweetgum, and white ash were from 25 to 50 percent taller when planted with alder, while white pine was only about 4 percent taller. This difference between species in the growth response due to alder was highly significant.

As the trees become older and the crown canopy closes, slow-growing species are likely to become overtopped by alder and the increasing competition may retard their growth. It may become necessary to follow the European practice of clipping the alder close to the ground after it has improved the site for other species. This study will be continued to see how long these early beneficial effects of alder persist.

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